

Residual Gas Analysis System

The Naval Research Laboratory is in the process of installing a chemical vapor deposition reactor for the growth of high purity silicon carbide. To achieve high purity growth requires a detailed understanding of the residual gases that are present in the reactor before and during experiments. Such an understanding requires the implementation of a residual gas analysis system. The residual gas analysis systems required must meet the following operation requirements:

1. Instrument must be able to residual gas species with masses up to 300amu.
2. The instrument must be able to monitor gases in an environment of 50-200 Torr that includes hydrogen, silane, hydrogen chloride (corrosive), chlorine (corrosive), and propane. The sampling should be achieved through a robust, flexible, heated (up to 200°C) quartz-lined capillary that is mounted on a capillary-to-KF-25 adaptor permitting integration with the chemical vapor deposition system.
3. System should be capable of response times of 500ms or less to monitored gases and vapors.
4. To address the corrosive nature of the process being sampled, any turbomolecular pumps should have an argon gas purge (argon gas to be supplied by NRL) and roughing pumps should be corrosion resistant.
5. The instrument should employ triple filter quadrupoles with a direct drive of pre- and post-filters and integrated LN₂ shrouds of the ionizer region to permit detection levels in the 5-10 parts per billion range. The integrated LN₂ shrouds should employ a reservoir permitting up to 6 hours of operation between LN₂ fills.
6. Full control of all operating parameters of the instrument should be available through software controls. Connectivity to the computer system should be either RS232 or Ethernet LAN. NRL will supply the computer system.
7. Software for operating the instrument should be Windows XP operating system compatible. Software displays are to include histogram, trend analysis of multiple mass peaks and peak profile. The software should perform quantitative analysis with data output in parts-per-billion, parts-per-million, or percentage values. Software should also provide comprehensive data output facilities including DDE, ASCII, clipboard exchange, and to the NIST mass spectral database.
8. The instrument should include two analog inputs via a signal-conditioning module enabling display of sample temperature and process pressure alongside the mass spectra.
9. The vacuum manifold of the instrument should be equipped with a spare KF-25 flange.
10. Instrument should be housed in a self-contained, compact, bench-top unit.
11. The residual gas analyzer should come with standard manuals (English), warranties, and training options. The quotation should include other options and spare parts that the manufacturer normally supplies. It is desired that an extended warranty (24 months) be provided from the date of delivery because the equipment is not expected to be run until approximately August 2005.